

# **Do Managerial Incentives Affect Mergers and Acquisitions?**

By

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## **Abstract**

This thesis investigates how CEO risk taking incentives related to compensation in the form of executive stock options affect the decision to engage in merger and acquisition (M&A) activities with particular attention to same-industry versus cross-industry acquisitions. Risk taking incentives increase the propensity of M&As, especially for same-industry M&As. Furthermore, risk taking incentives increase the likelihood of cash payment for both same and cross-industry acquisitions. We do not find a significant direct stock price response difference between same-industry and cross-industry acquiring firms. The market responds favorably when risk taking incentives are higher for both same-industry acquisitions and cross-industry takeovers. We further find that the acquiring firm's post-acquisition cash flow volatility is also positively related to risk taking incentives for both same- and cross-industry M&As.

**JEL Classification:** G32, G34, J33

**Key Words:** Managerial incentives; Risk-taking; Mergers and acquisitions; Cash flow volatility

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## 1. Introduction

Previous literature has documented how option-based compensation aligns managerial interests with those of shareholders, and thus induces managers to accept projects that increase their firm's value. Jensen and Meckling (1976) and Smith and Stulz (1985) posit that compensation associated with stock price performance is effective in relieving a manager's tendency to risk-aversion and encouraging him to invest in risky but positive net present value projects. This finding is related to the widespread use of executive stock options that are intended to link the compensation of CEOs with the interests of shareholders and thereby reduce agency problems. Conversely, Lambert et al. (1991) states that stock options do not necessarily encourage managerial risk-seeking behavior. Yermack (1995) and Cohen et al. (2000) further find that stock options may not reduce the agency conflicts since these options not only have an asymmetric payoff, but also do not usually pay dividends. In summary, previous theories highlight controversial predictions about the effects of incentive compensation on a CEO's risk-seeking behavior.

Executive compensation, specifically option-based compensation, does affect M&As (Crocchi and Petmezas, 2015) and this effect leads to the question: How do CEO risk taking incentives affect M&A activities? In theory a risk averse CEO's expected utility increases from an increase in wealth, but decreases from an increase in risk. Since the CEO possesses firm-specific human capital, he is less able to diversify firm specific risk than the firm's shareholders who have a well-diversified portfolio. The CEO would use a larger cost of capital than the firm's shareholders to evaluate risky projects, and he may reject risky projects even if such projects would have created value for shareholders. It is possible for a project to create value for the firm, while simultaneously decreasing the level of a CEO's utility.

We extend the literature by examining the relation between CEO risk taking incentives and M&A activities with particular attention to the differences between same-industry and cross-industry acquisitions. We expect risk taking incentives to affect M&As for the following reasons. First, M&As are risky investments as they have uncertain net present values. Second, CEOs' risk taking incentives can cause them to affect firm's long-term investment policies (Datta et al., 2001). M&As are one of the most important

corporate investment decisions, so a CEO's incentives should affect M&A activities. Third, M&As are risky investments for CEOs in particular because CEOs might be fired after M&As (Lehn and Zhao, 2006). Due to the existence of diversification effect, M&As might be optimal choices even though synergies are not positive (Thijssen, 2008). We especially test the effects of risk taking incentives on M&As with same-industry takeovers and cross-industry takeovers.

We construct two proxies for managerial compensation incentives: *Vega* is the change in the value of a CEO's wealth for a 0.01 change in annualized stock return volatility, and *Delta* is the change in the value of a CEO's wealth for a 1% change in annualized stock return. Using a sample of 23,667 firm-year observations between 1992 and 2013 we find that higher *Vega* is associated with a higher probability of taking over and if they proceed with the takeover, higher *Vega* is associated with a higher probability of same-industry takeovers. We also find that higher *Vega* is associated with higher likelihood of cash payment in M&As for both same-industry and cross-industry takeovers. We further investigate the stock market reaction of the acquiring firm after an acquisition and we find that a higher *Vega* is associated with a positive short-term cumulative abnormal return (CAR) for both cross-industry and same-industry takeovers. In other words, risk taking incentives help firms choose better than average cross-industry deals and same-industry deals based on the short term stock market response. We also find that higher *Vega* is positively correlated with higher post-M&A cash flow volatility for both same- and cross-industry takeovers.

Our study contributes to the literature on the following perspectives. First, our research provides empirical evidence in justifying the positive relation between risk taking incentives and a CEO's willingness to assume more risk. Adding both *Vega* and *Delta* into our empirical study allows us to isolate the effect of one and the other in testing the effects of risk taking incentives. Second, consistent with previous literature and the latest study of Croci and Petmezas (2015) our study sheds new light on the relation between risk taking incentives and the acquiring firm's intent in takeovers. The difference between our research and the study from Croci and Petmezas (2015) is that we control for the same-industry and cross-industry to test whether diversification matters in M&As. We further test the effects

of risk taking incentives on the short-term stock performance and post-M&A cash flow volatility by distinguishing between same- and cross-industry takeovers.

The rest of the paper is organized as follows. Section 2 reviews previous literature and develops hypotheses; Section 3 presents data and methodology; Section 4 discusses empirical results of research; Section 5 concludes that managerial incentives do affect mergers and acquisitions.



## 2. Literature Review and Hypothesis Development

### 2.1 Literature Review

#### 2.1.1 CEO risk taking incentives and M&A decisions

Risk taking incentives of CEOs influence firm's investing and financing decisions through linking CEO's personal wealth with both company risk and performance (Guay, 1999; Rogers, 2002; Denis and Mihov, 2003; Coles et al., 2006; Croci and Petmezas, 2015). Coles et al. (2006) advance the influence of executive stock options and show that CEOs can increase firm risk by applying riskier financial policy such as leveraging. Their empirical results document a positive relation between option-based compensation and the riskiness of financial policies. Their findings also include that higher *Vega* leads to lower investment in capital expenditures and higher stock return volatility. Latest paper (Croci and Petmezas, 2015) argues that risk-taking incentives do induce CEOs to carry out investments decisions and invest more in M&As.

The classic literature has well documented the risk-averse effect and the wealth effect of executive stock options on managerial incentives. On one hand, stock options will increase in value as stock return volatility increases and therefore, an increase in the convexity of the CEO's payoff by increasing the sensitivity of CEO wealth to firm risk would encourage CEOs to take more risk (Hall and Liebman, 1997; Hirshleifer and Suh, 1992). On the other hand, granting more options does not necessarily lead a manager to seeking greater risk (Carpenter, 2000). Due to a substantial increase of the sensitivity of CEO wealth to stock return (Hall and Liebman, 1997; Jensen and Murphy, 1990),<sup>1</sup> CEOs are discouraged to assume further risk (Smith and Stulz, 1985)). A drop in stock price might have a larger impact on the value of CEO's personal wealth than the increase of the volatility that increases CEO's personal wealth. Whether risk taking incentives motivate CEOs to bear more risk is still theoretically and empirically controversial.

For cross-industry M&As, diversification drives executives to pursue M&As, hence increasing their personal incentives (Amihud and Lev, 1981). In other words, M&As might be optimal choices even though synergies are not positive (Thijssen, 2008).

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<sup>1</sup> The sensitivity of CEO wealth to stock return is defined as Delta.

Therefore, M&As do not just necessarily result in efficiency gains and diversification is a strong determinant in M&A decisions.

Why do we use M&As? First, M&A is viewed as a risky investment in regards to the uncertainty of cash flow. Second, M&A exposes CEOs to risks because CEOs' personal employment relationship with the firm may terminate (Lehn and Zhao, 2006).

Why we use CEO's risk taking incentives? First of all, CEOs are likely to hold the decision-making authority in M&As, especially when CEO's pay is titled to incentive compensation (Graham et al., 2011). Second, managers behave consistently in their personal and professional lives and CEOs' personal behavior can partially explain corporate financial behavior of the firms they manage (Cronqvist et al., 2012).

### **2.1.2 CEO risk taking incentives and method of payment in M&As**

CEOs' risk taking incentives play a significant role in determining the method of payment in M&As (Martynova and Renneboog, 2009; Faccio and Masulis, 2005). Signaling hypothesis bases on the assumption that managers have inside information regarding the true value of the firm compared with target and shareholders. Specifically, asymmetric information between the bidder and the target on the value of the bidder shares allows the bidder to offer shares if these shares are overvalued and to offer cash if they are undervalued. Ismail and Krause (2010) empirically investigate the determinants of the payment form in M&As. They document, however, that asymmetric information is not an economically important determinant. Martynova and Renneboog (2009) focus on the methods of payment and assume that all-cash offers are entirely financed with internally generated funds and investigate the bidder's choice of the sources of financing in European corporate takeovers. They find that the financing decision is explained by pecking order preferences and the corporate governance environment, but not the agency conflicts between managers and shareholders, or between shareholders and creditors.

Why do we test the relationship between Vega and percent of cash offered in M&As? First, prior M&A study provides evidence that cash-paid M&As are mostly financed by debt (Faccio and Masulis, 2005). Hence, cash payment in M&As will increase a firm's leverage and therefore increase a firm's risk. Second, excess cash balances mitigate the

risk to bondholders from risk-taking incentives induced by high Vega compensation (Liu and Mauer, 2011).

### **2.1.3 CEO risk taking incentives and post-M&A stock returns**

Executive compensation plans, especially plans with stock options that held managers, are generally linking managements' personal wealth with that of shareholders (Cougulan and Schmidt, 1985; Myers and Majluf, 1984; Cornett and De, 1991; Datta et al., 2001; Martynova and Renneboog 2009; Croci and Petmezas, 2015). Cougulan and Schmidt (1985) find that executive compensation plans are effective in aligning the incentives of management to shareholders. To increase CEO's personal wealth, they would carry out positive net-present-value projects to increase firm's value and therefore increase the stock performance of the firm. Myers and Majluf (1984) further posit that different methods of payment in M&As, key reflections of asymmetric information, lead to different stock returns of bidders in mergers and tender offers. Stockholders of both acquiring and target firms obtain higher returns when a takeover is financed with cash while acquiring and target firms will get capital loss in equity offers (Shleifer and Vishny, 2003). Datta et al. (2001) document a strong positive relation between executive stock options received by acquiring managers and stock price response around and following corporate acquisition announcements. Martynova and Renneboog (2009) show that acquisitions financed with internally generated funds underperform debt-financed deals, suggesting that investors assume that cash-financed deals may be driven by managerial empire building motives. Latest empirical paper (Croci and Petmezas, 2015) documents a positive relation between risk taking incentives and bidder announcement return. On contrary, Cornett and De (1991) argue that the abnormal announcement period returns of cash offer and equity offers are not significantly different from each other. Similar findings are also documented in Yang et al. (2009) that cash offer acquirers and stock offer acquirers do not produce significantly different abnormal returns on equity for hospitality acquirers.

Theoretical papers (Travlos, 1987; Abowd, 1990; Travlos and Papaioannou, 1991) have compared the firm's post-M&A performance between cash-offer and stock-offer. Travlos (1987) posits that different method of payment in M&As are correlated with different stock returns of acquiring firms. They find that stockholders experience

significant losses at the announcement of the takeover proposal if acquiring firms fully pay stocks to finance. However, firms who pay cash in the M&A do not experience significant abnormal returns of stock. In other word, their stock returns fall in normal range. Their findings are consistent with the signaling theory that financing the takeover through stocks is negatively viewed by the market in that it conveys the information that the firm is overvalued. Using two models (discrete formulation and continuous formulation), Abowd (1990) examines the relationship between the sensitivity of managerial compensation and the following year's corporate performance and his findings indicate that shareholders would be benefited from increasing the performance-pay parts in the whole managerial compensation. Travlos and Papaioannou (1991) further explore the signaling models of Myers and Majluf (1984) in examining the effects of both the method of payment and the capital structure changes on the common stock returns for acquiring firms. They find that when firms' capital structure is stable, cash offers experience significantly higher abnormal returns than stock offers do. They also indicate that both abnormal returns of cash offers and of stock offers are not affected by the market participants' understanding of the capital change of the firms.

#### **2.1.4 CEO risk taking incentives and post-M&A cash flow volatility**

Previous literature documents the role of cash flow volatility in M&As. Froot et al. (1993) claim that firms may want to hedge cash flow volatility and therefore, the CEOs of those firms are using M&As as a method of risk management. Penas and Unal (2004) further justify that the primary determinants of merger-related bondholder gains are diversification gains and mergers are used as an operational hedge of cash flow volatility. Garfinkel and Hankins (2011) also support the risk management view and use empirical results to prove that risk management plays an important role in M&As at the firm and industry levels. They document that these firms experience cash flow volatility reduction after same-industry M&As.

## **2.2 Hypothesis Development**

As we discuss in Section 2.1, higher *Vega* motivates CEOs to increase firm's risk and therefore increase their personal wealth. We test the effect of *Vega* on firm's likelihood to takeover. Amihud and Lev (1981) posit that diversification of cross-industry takeover

drives executives to pursue M&As, hence increasing their personal incentives. This view is further justified by Thijssen (2008) who uses updated model to prove that M&As might be optimal choices even though synergies are not positive. In other words, M&As do not necessarily result in efficiency gains, but diversification is a stronger determinant in M&A decisions. We use these literature review to justify the following testable hypotheses.

*Hypothesis 1: Firms are more likely to carry out same-industry takeovers and are less likely to carry out cross-industry takeovers as CEO Vega increases.*

Armstrong and Vashishtha (2012) argue that higher *Vega* gives CEOs motivations to increase firms' total risk. Croci and Petmezas (2015) find a positive correlation between *Vega* and acquisition. As we discussed in the literature review, existing literature suggests that risk taking incentives should be positively associated with risky firm policies. However, cross-industry takeovers provide diversification for acquiring firms. Therefore, we posit the above hypothesis.

*Hypothesis 2: Firms are more willing to pay cash in M&As as CEO Vega increases.*

Cash offers are generally riskier offers,<sup>2</sup> higher *Vega* motivates CEOs to increase firms' risk. Consistent with the first hypothesis and previous literature that argue higher CEO *Vega* will persuade managers to take on greater risk, our second hypothesis regarding the relation between CEO's *Vega* and the cash payment will be as above.

*Hypothesis 3: For cross-industry M&A, firm's post-M&A CAR is positively correlated with Vega. For same-industry M&A, firm's post-M&A CAR is negatively correlated with Vega.*

Whether executive compensation plans are effective in aligning the incentives of management to shareholders is still in question. To increase a CEO's personal wealth, he would increase the stock performance of the firm. Hence firms should experience positive cumulative abnormal returns after M&As. This relation is well documented in Croci and Petmezas (2015). However, Loomis (1982) claims that there is no link between management compensation and measures of stock price performance. His study finds no relations between management compensation and the stock performance afterwards.

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<sup>2</sup> Reasons are provided in the literature review section 2.1.2.

Amihud and Lev (1981) find that diversification drives executives to pursue M&As, hence increasing their personal incentives.

Our hypothesis is based on the previous two hypotheses. If CEOs with higher *Vega* are more commonly to take over other firms and are more likely to use cash to finance the take-over, market might react to CEO's decision negatively because of the over-optimal risk firms will bear. However, due to the diversification effect of cross-industry takeover, market might react to cross-industry takeover positively. Hence, we posit the above hypothesis.

*Hypothesis 4: Firms will experience positive post-M&A cash flow volatility as CEO Vega increases.*

Higher risk taking incentives may encourage CEOs to assume excessive risk. For firms with higher Vega and higher cash reserves, they may be more likely to pay cash in M&As. For firms with higher Vega and without enough cash holdings, they may be more willing to issue more debt. Either way will increase firm's cash flow volatility after M&A. Garfinkel and Hankins (2011) supports the risk management view that firm's operation is related to cash flow volatility in a risk-managing perspective. Based on previous literature and hypotheses, we posit our fourth hypothesis as above.

### 3. Data and Methodology

#### 3.1 Data and sample

The initial sample covers the period from 1992 to 2013.<sup>3</sup> We collected accounting data from Compustat, CEO compensation data from Execucomp, daily stock price from CRSP, and Merger and Acquisition data from SDC. We merged data from these source to form our initial sample and took several steps to clean the primary sample to our Base Sample. First, Consistent with previous studies we excluded financial firms (SIC 6000-6999) and utility firms (SIC 4900-4999). Second, we excluded specific firm-year observations from our sample if the firm misses such critical variables as total asset, sales, *Vega*, or, *Delta*. We further excluded firm-year observations with negative equity. Third, we replace missing values of capital expenditures with zero. Our base sample has 23,667 firm-year observations. All the observations of the base sample are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles to eliminate outliers. Table 2 presents the description of the sample.

Testing hypothesis 2 calls for a sample consisting firms that have successfully completed a takeover. We took further steps to construct our hypothesis 2 sample by ensuring that:

1. Essential information, including transaction dates, types, sic, etc. is not missing.
2. The transaction value is over 1 million dollars and we keep the largest takeover of the year for analysis.
3. The acquisition is either a majority stake purchase (no less than 50 percent) or a 100 acquisition of the target firm.
4. Cash payment is defined as 100% cash offered in the M&A deal.<sup>4</sup>

The resulting sample contains 3,893 firm-year observations. All the observations are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles to eliminate outliers. Testing Hypothesis 3

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<sup>3</sup> Execucomp modified the reporting format in 2006. Calculation method is revised after 2006.

<sup>4</sup> We only consider cash and stock offered as payment in take-over due to the availability of data. Other payment methods, labeled as unknown or other in SDC, are not considered in this paper.

requires the availability of CAR and testing hypothesis 4 requires the availability of cash flow volatility. After meeting with the above requirements, the sample size shrinks to 3,018 and 2,071 respectively.

## 3.2 Methodology

### 3.2.1 Vega and M&A decisions

As literature suggests, *Vega* possesses important significance in determining the willingness of CEO to take risks and thus impacts the likelihood of firms to take over potential targets. To directly test the effects of *Vega* on the likelihood of taking over, we adopt the sequential logit model as follows:

Non-takeover means firms with no takeovers over \$1 million in value in certain year. Takeover within same industry means at least one takeover took place, the largest of which has a target in the same industry as measured by two-digit SIC.<sup>5</sup> Takeover within different industry means at least one takeover took place, the largest of which has a target in a different industry as measured by two-digit SIC.

$P_{t+1}(x, i)$  is the probability that observation  $i$  has outcome of  $x$ .

$$P_{t+1}(x, i) / (1 - P_{t+1}(x, i)) = a + \beta_{1,x} * Vega_t + \beta_{m,x} * Controls_t + e_t \quad (1)$$

$X = 0$  for non-takeover firms;

$X = 1$  for firm that take over within the same industry;

$X = 2$  for firm that take over within different industries.

Consider the following scenarios of firms' takeover decisions. It consists of two transitions: First a firm decides whether it takes over another firm or not, then given that it carries out the takeover decision the firm decides whether it takes over the target that operates within the same industry or within a different industry. The first transition

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<sup>5</sup> For robustness, we identify takeovers within the same industry as takeovers for which firm only one deal over \$1 million takes place and the target is from the same industry as the bidding firm as measured by two-digit SIC. Takeover within different industry is defined as takeovers of which firm only one deal over \$1 million takes place and the target is from a different industry as the bidding firm as measured by two-digit SIC.



compares  $X = 0$  and  $X = 1$  or  $X = 2$ ; the second transition compares  $X = 1$  and  $X = 2$ .

We link CEOs' willingness to take risks with likelihood of taking over for the following reasons. First, M&As are risky investments in regards to uncertain net present value.<sup>6</sup> Second, consistent with Datta et al. (2001), CEO's risk taking incentives impact firm's long-term investment policies. M&As are considered important corporate investment decisions. Hence it is reasonable to conclude that risk taking incentives influence the firm's M&A decisions.

Our main independent variable is  $Vega_t$ , which measures the change in the value of CEO wealth for a 0.01 change in annualized stock return volatility in year  $t$ . We use  $Vega$  in previous year because it is known by the CEO ahead of time, and it mitigates reverse causality with the CEO compensation potentially decided post-merger. According to our hypothesis 1, we expect a positive sign of the coefficient for  $Vega_t$  for same-industry takeover and a negative sign of coefficient for  $Vega_t$  for cross-industry takeover.

To investigate how  $Vega$  affects the CEO's willingness to take risks, it is of great importance to control the other factors that may impact M&As. Consistent with our main independent variable, we choose  $Controls_t$  in year  $t$ . We first control firm size ( $SIZE$ ) because Benson et al. (2014) suggests that for smaller firms equity risks are generally higher.<sup>7 8</sup> Therefore, CEOs will consider firm size when they make take-over decisions on whether or not to take more risks. We would expect a positive sign of the coefficient of firm size.

An acquiring firm with higher leverage would be more careful in making take-over decisions because they would have to pay back the debt at certain point and thus may affect the capability to raise more capital (Faccio and Masulis, 2005). Hence we also control for firm's  $LEVERAGE$  and we would expect a negative sign of its coefficient.

A firm spending more on capital expenditures will reduce the need and funds

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<sup>6</sup> As Croci and Petmezas (2015) argue, regardless of whether all acquisitions increase firm's risk or not, acquisitions expose a certain degree of risk to CEO.

<sup>7</sup> We have also used  $LOG\_SALES$  as a proxy of the firm size and the findings still hold in robustness tests.

<sup>8</sup> In robustness test, we replace  $SIZE$  with  $LOG\_SALES$  and the results are still consistent.

available for an M&A. Therefore, *CAP* is used as another control variable and we would expect a negative sign of its coefficient.

*BM* ratio is used to proxy for firm's valuation. Firms with more likely to invest in M&As when their stocks are overvalued (Shleifer and Vishny, 2003). We proxy for growth opportunities using *SALE\_GROWTH*, and *ROA*. One explanation is that firms with higher sales growth are more likely to have higher cash reserve and hence, they are more likely to invest in M&As. We would expect a positive sign of the coefficient of sales growth and *ROA*, but a negative sign of that of *BM*.

Eventually we also control for both year and industry effects. We also control on Delta and reports the results in related tables.

### 3.2.2 Vega and cash payment

To test the association between likelihood of cash payment and the CEO risk taking incentives, we adopt the following logit model:

$$\begin{aligned} \text{Logit}(P_{\text{cash } t+1} / (1 - P_{\text{cash } t+1})) & \quad (2) \\ &= a + \beta_1 * \text{Vega}_t + \beta_2 * \text{Same\_Industry} + \beta_3 \\ &\quad * \text{Same\_Industry} * \text{Vega}_t + \text{Controls}_t + e_t \end{aligned}$$

$P_{\text{cash}}$  is defined as the possibility of firm paying 100% cash in M&As. We use 100% cash payment in M&As for the following two reasons. First, cash reserves are important for the firms as cash is safer than other assets. Therefore, paying cash would decrease the holdings of safe assets of the firms and hence would imply the risk-seeking of CEO. Second, cash offers and stocks offers are two important offers in takeovers. The risk of the takeover would be largely shared by the bidders and targets if the bidder pays in stocks. However, bidders who pay cash are generally acquiring firms that seek risks. To test the difference between same- and cross-industry takeovers, we include *Same\_Industry* that takes 1 for firms that carried out M&As within the same-industry and takes 0 otherwise. We include another interactive term *Same\_Industry\*Vega<sub>t</sub>* to test different effects of *Vega* on likelihood of takeover in M&As. Consistent with hypothesis 1 and previous literature, our main independent variable is *Vega<sub>t</sub>*. We use lagged compensation incentives because they

are influencing the following year's risk taking behaviors and policies' riskiness. Based on our hypothesis 2, we expect a positive sign of the coefficient for  $Vega_t$  for both same-industry takeover and cross-industry takeover. Acquiring firms paying more cash assume more risk as cash payment does not provide risk-sharing benefits for them.

We further control other factors that may impact M&As. Consistent with our main independent variable, we choose  $Controls_t$  in year  $t$ .

We first control firm size ( $SIZE$ ) because Benson et al. (2014) suggests that for smaller firms equity risks are generally higher. Therefore CEOs will consider firm size when they make take-over decisions on whether or not take more risks. We would expect a negative sign of the coefficient of firm size.

An acquiring firm with more growth opportunities is more likely to pay the offer in shares instead of cash, because it prefers to reserve the cash to finance other investment opportunities required for growth (Swieringa and Schauten, 2007). Therefore,  $SALES\_GROWTH$  is used as a control variable and we would expect a negative sign of its coefficient.

Firms with higher debt and capital expenditures have more difficulty in raising cash for M&As. Faccio and Masulis (2005) find a negative association between leverage and the likelihood of using cash payment. The influence of leverage and capital expenditures in the payment method is still ambiguous. We use  $LEVERAGE$  and  $CAP$  as controls and expect negative signs of their coefficients.

The profitability of the acquiring firm, measured by  $ROA$ , along with the valuation of the firm by the market, measure by  $BM$ , can also affect M&As. Firms that are more profitable would be more likely viewed as good firms by the market participants and therefore, have lower BM ratio. CEOs of firms with low BM ratio are more likely to use shares to pay for the take-over because in this way not only the risks are shared by the bidder and the target, but also the firms can save cash and make a better deal (Shleifer and Vishny, 2003).

Consistent with Benson et al. (2014), we include *RVALUE* as control. We also include *TENDER\_OFFER* according to Myers and Majluf (1984). Another deal's characteristics, *A\_PREMIUM* is also included as a control.

In takeovers where more than one bidder is competing for one same target, the bidder might want to close the deal fairly quick and hence the bidder would choose cash payments over stock offers (Schwert, 1999). Therefore, the *NUM\_BIDDER* is used as a control.

Other firm board characteristics including CEO's age, tenure, and gender are also included as controls. Yim (2013) documents that CEOs are motivated to pursue acquisitions and seek higher risk when they are younger. Therefore, a negative sign is expected for age. Ali and Zhang (2015) argue that CEOs try to influence the market's perception of their ability in a positive way when the market is more fluctuating and when they are younger. Adhikari et al. (2015) find that older CEOs are perceived as more reliable and their compensations are already higher on average compared to younger CEOs. Higher years of service in the company may motivate CEOs to take less-risky method of payment in M&As since their hard-work has already been perceived by the board. Hence, we expect a negative sign of tenure. Levi et al. (2014) state that female directors are more likely to be risk-averse and are less likely to make acquisitions. Hence, we expect a negative sign of the coefficient of female.

### **3.2.3 Vega and CAR**

As suggested by the literature review, the association between risk taking incentives and post-M&A stock return performance is still ambiguous. Market perception of diversification effects also determines M&As.

We use several performance measures to examine the effects of *Vega* on the firm returns after M&As. Using the daily raw holding period returns for the period starting from January 1<sup>st</sup>, 1992 and ending on December 31<sup>st</sup>, 2013 from the Center for Research in Security Prices (CRSP), we construct [0, 5] CAR to measure the cumulative abnormal return after the announcement day of the takeover.

To calculate cumulative abnormal returns, we start by estimating the parameters of the market model for each firm in the sample using value-weighted market index. Our

estimation period for the parameters of the market model is 252 trading days before the window.<sup>9</sup> We use a 30 day break between estimation and event windows to avoid contaminating the estimation window with information or rumours about the event that may have been leaked prior to the event. After estimating the parameter of the market model, we estimate the abnormal return for each firm for days from  $t = 0$  to 5.

We use the same model as in Brick et al. (2012) to construct the daily abnormal return. The model is as following:

$$AR_{i,t} = (R_{i,t} - a_i - \beta_i * R_{m,t}),$$

$AR_{i,t}$  is the daily abnormal return of firm  $i$  at day  $t$  after the announcement day of the takeover.  $R_{i,t}$  is the actual return of firm  $i$  at day  $t$  after the announcement day of the takeover.  $a_i$ ,  $\beta_i$ , and  $R_{m,t}$  are parameters that are estimated using daily holding period return of 252 trading days before the window. We construct the excess returns by using the sum of daily abnormal returns over five-day period.

The regression regarding to CAR is as followed.

$$CAR_{t+1} = a + \beta_1 * Vega_t + \beta_2 * Same\_Industry + \beta_3 * Same\_Industry * Vega_t + Controls_t + e_t \quad (3)$$

$CAR_{t+1}$  is the cumulative abnormal return in period  $t+1$ . The main dependent variable would still be  $Vega_t$ . To test the diversification effect, we also include  $Same\_Industry$  that takes 1 for firms made M&As within the same-industry and takes 0 otherwise. We have included another interactive term  $Same\_Industry * Vega_t$  to test the effects of  $Vega$  on post-M&As CAR. All other controls are similar to that of equation (1).

Consistent with our hypothesis, we expect a negative coefficient of  $Same\_Industry * Vega_t$  and a positive coefficient of  $Vega_t$ . Explanations are that risk-taking incentives motivate CEOs take additional risk by engaging in same-industry takeovers and also paying cash in M&As. This is negatively viewed by the market. However, CEOs may

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<sup>9</sup>  $t = -282$  to  $-31$

also focus on risk-decreasing cross-industry takeover and this diversification effects are positively viewed by the market.

Levi et al. (2015) argue that female directors are positively viewed by the market and they can create shareholder value through their influence on M&As. Therefore, we expect a positive sign of female. Serfling (2014) find that firms with older CEOs earn lower risk-adjusted stock returns. Hence, we expected a negative sign of age. Adhikari et al. (2014) find that CEOs with higher tenure are perceived as more trustworthy. A positive sign of tenure is expected.

### 3.2.4 Vega and cash flow volatility

To further test the association between *Vega* and post-M&A firm risk. We test the relationship between *Vega* and post-M&A cash flow volatility.

Using the quarterly raw cash flow to asset for the period starting from January, 1987 and ending in December, 2014 from COMPUSTAT, we calculate standard deviation of cash flow to asset as a proxy of cash flow volatility to examine the effects of *Vega* on firm's risk after M&As. Definition of cash flow to asset is available in table 1. Our estimation period is 5 year before and after M&As.

The regressions on cash flow volatility would be as followed.

$$CFVT_t = a + \beta_1 * Vega_t + \beta_2 * Same_{Industry} + \beta_3 * Same_{Industry} * Vega_t + Controls_t + e_t \quad (4)$$

$CFVT_t$  is the cash flow volatility in the following five years after M&As. To test the difference between same- and cross- industry takeovers. We include *Same\_Industry* that takes 1 for firms made M&As within the same-industry and takes 0 otherwise. We also include another interactive term *Same\_Industry*\**Vega<sub>t</sub>* to test different affects of *Vega* on post-M&As cash flow volatility. The main dependent variable would still be *Vega<sub>t</sub>*. All the other controls are similar to that of equation (1). Additionally, to control current cash flow volatility, we have also included current cash flow volatility as a control variable.

Consistent with our hypothesis 4, we expect a positive coefficient of *Vega<sub>t</sub>* and no significance of *Same\_Industry*\**Vega<sub>t</sub>*.

## 4. Empirical Results

### 4.1 Summary statistics

We report the summary statistics of major dependent and independent variables in Table 2. The table shows us that the mean values of *Vega* and *Delta* of total sample are \$120,980 and \$566,240 respectively. Because of the great degree of incentives generated by executive stock options, CEOs do have the motivation to increase firm value and equity return volatility to cumulate their personal wealth. Our averages of *Vega* and *Delta* are similar to the summary statistics in Coles et al. (2006) and Benson et al. (2014).<sup>10</sup>

[Insert Table 2 here]

We further divide our sample into three groups, Acquirer (Same Industry) for firms whose largest deal of takeover is in that year within the same-industry within the time period, Acquirer (Different Industry) for firms whose largest deal of takeover in that year is from different industries within the time period, and Non-acquirer for firms who have no take-over actions within the time period. The same-industry acquirers show an average *Vega* of \$141,370 and the cross-industry acquirers have an average *Vega* of \$153,960. Both of them are significantly higher than the average *Vega* of NON-acquirer group (\$115,660), indicating that firms with higher *Vega* may be more likely to act as a bidder and take over potential target firms. The average *Delta* of Acquirer group (\$682,170 and 703,660 for same-industry and cross-industry respectively) is also significantly higher than the average *Delta* of NON-acquirer group (\$541,120), suggesting that firms with higher *Delta* may also be more likely to take over other firms.

We see a higher average size in Acquirer (Different Industry) and a lower average size in Acquirer (Same Industry) compared to Non-acquirer. Higher sales growth rate of Acquirers group (0.14 and 0.12 for same-industry and cross-industry respectively), comparing with NON-acquirers (0.08), implies that firms with higher sales growth rate in general are more likely to be potential acquirers. Leverage, however, plays a negative role in showing the potential of bidders. Acquirers process a leverage ratio of 0.16 and 0.18, for

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<sup>10</sup> Our mean and median are higher than Coles, Daniel and Naveen (2006), but lower than Benson, Park, and Davidson III (2014) because of the different sample and time period chosen.

same-industry and cross-industry respectively, which is lower than or equal to that of Non-acquirers who have an average 0.18 leverage ratio. The explanation is that firms with higher leverage generally have higher debt, and they choose to not get involved in riskier projects such as M&As. We find a higher average capital expenditure rate in Acquirer (Same Industry) and a lower average capital expenditure rate in Acquirer (Same Industry) compared to Non-acquirer. Additionally, we find that higher book-to-market ratio is also associated with lower likelihood of being potential bidders. Higher ROA, on contrary, is associated with higher likelihood of taking over, which indicates that firms with higher profitability are more commonly to take over potential targets. Acquirer group (Same Industry and Different Industry) also shows a lower age, a higher tenure, and a lower average female CEOs compared to Non-acquirer.

## 4.2 Correlations of variables

The correlation matrix between dependent and independent variables is presented in table 3. We find that most of dependent and independent variables are correlated with each other. However, the magnitude of correlation between most variables is quite small. We also notice that high correlation exists between *Vega* and *Delta*, which is 0.453. To avoid multicollinearity concerns, we include regression models both with and without *Delta* and the results still hold. *LOG\_SALES* and *SIZE* are also highly correlated with each other and it is economically significant. We reported the main results using *LOG\_ASSET* (*SIZE* in the outputs) as a control of firm size.<sup>11</sup>

[Insert Table 3 here]

## 4.3 Vega and M&A decisions

Table 4 shows the results of testing the effect of *Vega* on the likelihood of taking over and the likelihood of takeover within same industry or within different industry. The first two columns are related to the effects of *Vega* on the likelihood of taking over and the next two columns are related to the effects of *Vega* on the likelihood of same- and cross-industry takeovers.

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<sup>11</sup> We replace *LOG\_ASSET* with *LOG\_SALES* as a robustness test and find consistent and similar results.



[Insert Table 4 here]<sup>12</sup>

As presented in table 4 (TAKEOVER vs NON-TAKEOVER), the positive and significant coefficient 1.891 suggests that there is a positive association between *Vega* and likelihood of taking over. After controlling Delta, we observe that the relation of *Vega* on the likelihood of takeover still holds. Hence, we are able to conclude that higher *Vega* motivates CEOs to pursue investments in M&As. A positive coefficient of 3.355 in model I (SAME\_INDUSTRY vs CROSS\_INDUSTRY) is shown in table 4 and the sign of the coefficient still holds after controlling Delta. Our finding suggests that high *Vega* is associated with higher likelihood of same-industry takeover if the firm decides to proceed with the M&A.<sup>13</sup>

The coefficients of SIZE in model I and II (TAKEOVER vs NON-TAKEOVER) are not significant, but the coefficients of SIZE in model I and II (SAME\_INDUSTRY vs CROSS\_INDUSTRY) are significant and negative, indicating a negative correlation between firm size and likelihood of same-industry taking over conditional on takeovers. One explanation is that larger firms may tend to get involved in cross-industry M&As to diversify the risk, which they cannot achieve in getting involved in same-industry M&As. Another explanation is that same-industry deals involving larger firms are more likely to attract regulatory scrutiny.

Sales\_Growth possesses a positive correlation with likelihood of taking over and conditional on takeovers bidder firms with higher sales growth are more likely to carry out same-industry takeovers because firms with higher sales growth are more likely to be growing companies and to maintain the growth rate, CEOs are more likely to take over other firms. LEVERAGE does not play a role in TAKEOVER vs NON-TAKEOVER, but the coefficient of leverage is negative in SAME\_INDUSTRY vs CROSS\_INDUSTRY, suggesting that when firms decide to do the takeover, higher leverage is associated with lower likelihood of same-industry takeovers. CAP shows a negative correlation with

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<sup>12</sup> We also include LOG\_AGE, LOG\_TENURE, and FEMALE in our robustness tests and find similar results.

<sup>13</sup> We have also tested the net effect of *Vega* on cross-industry takeover and found that higher *Vega* is associated with higher likelihood of cross-industry takeover.

likelihood of taking over, which indicates that firms with higher capital expenditure rate are more concerned with the budget and risks from the M&As, therefore they are less likely to invest in M&As. However, the sign of CAP reverses in SAME\_INDUSTY vs CROSS\_INDUSTY is positive, which suggests that higher capital expenditure rate motivates firms invest in the same industry takeovers. Consistent with Shleifer and Vishny (2003), we find that firms with lower BM ratio are more likely to launch acquisitions. But BM does not possess significance in SAME\_INDUSTY vs CROSS\_INDUSTY. ROA possesses a positive relationship with likelihood of taking over. Firms with higher profitability are more likely to carry out M&A projects. However, higher ROA is negatively associated with same-industry takeover after the firm decides to launch the takeover. One explanation is that same-industry opportunities are not enough to let firms maintain its current return and therefore they are more likely to seek opportunities in other industries.

We are able to reject hypothesis 1 based on the above findings and conclude that firms with higher risk taking incentives are more likely to carry out takeovers and if they do they are more likely to acquire firms from the same industry.<sup>14</sup>

#### **4.4 Vega and cash payment**

To further examine the effect of *Vega* on the CEO's willingness to take more risks, we use logit model to test their relationship between Vega and possibility of 100% cash payment in M&As and the results are presented in Table 5.

[Insert Table 5 here]

The positive and significant coefficient of *Vega*, 0.945, in model I suggests that one standard deviation increase in stock return volatility is associated with  $e$  to the power of 0.945<sup>15</sup> the size increase of likelihood of 100% cash payment in M&As. This positive correlation indicates that higher *Vega* would drive CEOs to take more riskiness and therefore use cash to pay for the cross-industry take-over. The coefficient of

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<sup>14</sup> The net effect of Vega on cross-industry takeover is also positive.

<sup>15</sup> In table 5, we reported the relative risk ratio instead of odd ratios.

*Same\_Industry*\**Vega<sub>t</sub>* is not significant, suggesting that higher *Vega* would also drive CEOs to take more risk and therefore use cash to pay for same-industry takeovers.

The coefficients of *SALE\_GROWTH* in model III to VIII are negative and significantly different from zero. A negative relation between *CAP* and likelihood of takeover and a negative relation between *LEVERAGE* and likelihood of cash payment are also documented in table 5. The negative correlation can be explained by that firms who have higher capital expenditures and higher leverage are more likely to be short in cash, therefore they are less likely to use cash as payment in M&As. *ROA* shows a positive coefficient, which implies that firms with higher profitability are more likely to have enough cash and they are more likely to pay cash in M&As. Both *R\_VALUE* and *A\_PREMIUM* possess negative relations with *Vega*. This is because firms may experience difficulty to raise that huge amount of cash if the transaction value is too high. Therefore, they have to choose other payment methods instead of cash. Tender offers are more likely to become cash offers. *LOG\_TENURE* holds a positive coefficient, rejecting our expectation. But the coefficient of *FEMALE* is positive and within our expectation.

Our findings overall are in favor of the second hypothesis. We are able to conclude that firms are more likely to pay cash as *Vega* increases and there is no significant difference of *Vega*'s effects between same-industry M&As and cross-industry M&As.

#### **4.5 Vega and post-M&A stock return**

Besides the effects of *Vega* on the risk taking of CEO's, we further investigate on the effect of *Vega* on post-M&A stock return performance. Table 6 shows the results.

[Insert Table 6 here]

The coefficients of *Vega<sub>t</sub>* is positive and significantly different from zero, which indicates that *Vega<sub>t</sub>* is positively correlated with cumulative abnormal return of cross-industry take overs in [0, 5] period. The coefficient of 0.0207 percent in model III indicates that one standard deviation increase in stock return volatility is associated with 2.07 percent increase in CAR for cross-industry takeovers. The coefficient of *Same\_Industry*\**Vega<sub>t</sub>* is negative but insignificant. It is concluded that the market reacts similarly to same- and cross- industry takeover associated with high *Vega*: market participants welcome cross-

industry takeovers done by risk-seeking CEO and they also show similar enthusiasm towards same-industry takeover done by risk-loving CEOs. This is inconsistent with our hypothesis 3: high *Vega* takeover in the same-industry is not favored by the market. Market participants do not differentiate between same-industry takeovers and cross-industry takeovers and they consider both as favorable takeovers. Our findings still hold after controlling Delta.

Holding others constant, larger firms will process lower abnormal returns, as we can observe from model IV and model V from Table 6. Higher capital expenditure is associated with lower cumulative abnormal return, which indicates that the market participants react to firms with higher capital expenditure negatively.

The findings in total reject hypothesis 3 and we conclude that firms will experience positive post-M&A CAR for both same-industry M&As and cross-industry M&As.

#### **4.6 Vega and Post-M&A cash flow volatility**

In addition to the effects of *Vega* on firm's post-M&A stock return performance, Table 7 presents the results of *Vega* on cash flow volatility after M&As.

[Insert Table 7 here]<sup>16</sup>

The coefficients of  $Vega_t$  are positive in model III and model IV, which indicates that firms who carried out cross-industry take overs will experience positive increase in cash flow volatility. The significantly positive coefficient of 0.0231 indicates that one standard deviation increase in stock return volatility is associated with 0.0231 increase in post-M&A cash flow volatility. The coefficients of  $Same\_Industry * Vega_t$  are positive in model III and model IV but not significant. We are able to conclude that a positive correlation exists between *Vega* and post-M&A cash flow volatility for cross-industry takeovers and same-industry takeovers.

The negative coefficient of *SIZE* suggests that firm's size is negatively correlated with future cash flow volatility, which may be explained by that larger firms have more capability in managing their future cash flow volatility. Firms with more growth potentials

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<sup>16</sup> We also include LOG\_AGE, LOG\_TENURE, and FEMALE in our robustness tests and find similar results.

will have higher cash flow volatility, as indicated by the positive coefficients of SALES\_GROWTH. This is because firms with more growth potentials are more likely to invest in other projects, and they are more likely to experience volatile cash flow after they have invested in a giant project, such as M&As. Similar to growth potentials, firms with higher capital expenditure rate will also be more likely to experience volatile cash flow according to the positive coefficients of leverage. Firms with higher leverage are more likely to be firms that are short in cash, they would have lower cash flow volatility. Therefore, we are able to see the existence of a negative correlation between LEVERAGE and Vega. Firms with higher profitability are better managing cash flows, hence the coefficients of ROA are negative in model III and model IV. In regard to the deal size, the transaction value plays an important role in determining the post-M&A cash flow volatility. Higher transaction value will result in higher RVALUE in our regression and make firm's cash flow more volatile. Hence, the coefficient of RVALUE is positive. All the previous findings in this session are consistent after we control the current cash flow volatility.

The results support hypothesis 4 that firms will experience positive post-M&A cash flow volatility for both same-industry M&As and cross-industry takeovers.

## 5. Conclusions

Previous literature has documented the effects of a CEO's risk taking incentives on his personal wealth. Liu and Mauer (2011) using cash holdings as a proxy for a CEO's risk-seeking behavior suggest that *Vega* is positively correlated with a firm's cash holdings indicating that risk-aversion effect dominates the wealth effect. Cohen et al. (2000) find empirical evidence that supports the existence of the wealth effect that incentivizes CEOs to increase a firm's risk to grow his personal wealth.

In this thesis we present direct evidence of a positive link between a CEO's *Vega* and the firm's willingness to assume more risks in regards to M&A activities. Our main results still hold after controlling a CEO's *Delta*. We find that firms with a higher sales growth rate, a lower capital expenditure rate, a lower book to market ratio, and a higher ROA rate are more likely to acquire a potential target firm. Firms with a lower size, a higher sales growth rate, a lower leverage, a higher capital expenditure rate, and a lower ROA rate are also more likely to take over other firms operating within the same industry when the firm decides to carry out the takeover plan.

We also use the 100% cash payment in an M&A deal and find that the likelihood of cash payment is positively correlated with a CEO's *Vega* in both same-industry takeovers and cross-industry takeovers. Firms with a lower sales growth rate, a lower capital expenditure rate, a lower leverage and a higher amount of profitability are more likely to pay cash in an M&A deal. When the deal has a higher value relative to the acquiring firm's total assets, a lower acquisition premium and fewer bidders bidding at the same time, it is more likely to be funded by cash. A tender offer is more likely to take the form of a payment in cash.

Post-M&A stock performance using  $[0, 5]$  abnormal returns in a cross-industry acquisition shows a favorable market response when risk taking incentives are higher. The market responds favorably when risk taking incentives are higher for same-industry acquisitions and cross-industry acquisitions. One explanation for these findings is that market participants do not have as much information as bidding firms and therefore, they are not able to differentiate the benefits between same-industry and cross-industry

takeovers. Using cash flow volatility, our results show that firms experience higher cash flow volatility after either same-industry takeover or cross-industry takeover.

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**Table 1 Variable definitions and data sources**

Variable	Definition	Source
VEGA	The change in the value (in thousand dollars) of CEO wealth for a 1% change in annualized stock return volatility	Execucomp and CRSP
DELTA	The change in the value (in thousand dollars) of CEO wealth for a 1% change in stock return	Execucomp and CRSP
SIZE	Natural logarithm of total assets. Asset is the total asset denoted in million dollars	Compustat
LOG_SALES	Natural logarithm of total sales revenue. Sales is the total sales denoted in million dollars	Compustat
SALES_GROWTH	Sales Growth = $\text{Log} ( \text{Sales}_t / \text{Sales}_{t-1} )$ .	Compustat
LEVERAGE	Total long term debt / Book value of total assets	Compustat
CAP	Capital expenditure / Book value of total assets	Compustat
BM	Total common equity / Market value of equity	Compustat
ROA	Net Income/ Total Asset	Compustat
A_PREMIUM	(highest price paid per share - the target share price four weeks prior to the announcement date) / target share price four weeks prior to the announcement date.	SDC
S_IN_TAKEOVER	1 for target firm that does not have the same two-digit Standard Industrial Classification (SIC) code as the acquiring firm, 0 otherwise	SDC
S_IN_VEGA	$S\_IN\_TAKEOVER * VEGA$	Execucomp and SDC
NUM_BIDDER	Number of bidders participated in the takeover deal	SDC
RTVALUE	Transaction value / Acquiring firm's total assets	COMPUSTAT and SDC
TENDER_OFFER	1 for tender offers, 0 otherwise	SDC
CFV	Forward 5-year standard deviation of cash flow to asset. Cash flow to asset is calculated as (Income before extraordinary items + depreciation - dividends on common and preferred stock) / total assets	COMPUSTAT
CFV_CURRENT	Previous 5-year standard deviation of cash flow to asset. Cash flow to asset is calculated as (Income before extraordinary items + depreciation - dividends on common and preferred stock) / total assets	COMPUSTAT
LOG_AGE	Natural logarithm of the CEO's Age	Execucomp
LOG_TENURE	Natural logarithm of the number of years the CEO has held the title of CEO at the firm. Calculated as the difference between the year of the observation and the year in which the executive became CEO	Execucomp
FEMALE	1 for female CEO, 0 otherwise	Execucomp
CASH	1 for firms that offer 100% of cash to the target firm as payment, 0 otherwise	SDC

## Table 2 Summary Statistics

This table presents descriptive statistics for a sample of US acquisitions announced between January 1<sup>st</sup>, 1992 and December 31<sup>st</sup>, 2013 drawn from the Thomson Financial SDC Mergers and Acquisitions Database. Stock price data is from CRSP, accounting data is from COMPUSTAT, and the compensation data is from EXECUCOMP. *Total sample* is the full sample and *Acquirer (Same Industry)* consists of firms that have taken over within the same-industry in the time period. *Acquirer (Different Industry)* consists of firms that have taken over within different industries in the time period. *Non-acquirer* is a group of firms that have not taken over within the time period. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return. *LOG\_SALES* is Natural logarithm of total sales revenue and *SALES\_GROWTH* equals  $\text{Log}(\text{Sales}_t / \text{Sales}_{t-1})$ . *SIZE* is Natural logarithm of total assets. *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA*, is defined as the ratio of net income to total assets. *LOG\_AGE* is Natural logarithm of CEO's age and *LOG\_TENURE* is Natural logarithm of number of years the CEO has held the title of CEO at the firm. *FEMALE* takes 1 for firms with female CEOs. All variables have been winsorized at 1<sup>st</sup> and 99<sup>th</sup> percentiles of the empirical distribution.

**Table 2 Summary Statistics**

Variable	Total sample					Acquirer(Same Industry)		Acquirer(Different Industry)		Non-acquirer		N
	Mean	Std	Min	Median	Max	Mean	Std	Mean	Std	Mean	Std	
VEGA	120.98	195.54	0.14	47.01	1155.73	141.37	216.13	153.96	229.16	115.66	189.18	23667
DELTA	566.24	1188.73	3.67	189.93	8513.36	682.17	1318.38	703.66	1373.58	541.12	1153.17	23618
LOG_SALES	7.24	1.57	3.85	7.14	11.20	7.00	1.55	7.43	1.68	7.25	1.55	23667
SALES_GROWTH	0.09	0.20	-0.53	0.08	0.84	0.14	0.21	0.12	0.21	0.08	0.20	23198
SIZE	7.47	1.67	4.15	7.34	11.98	7.34	1.63	7.65	1.69	7.46	1.67	23667
LEVERAGE	0.18	0.16	0.00	0.16	0.62	0.16	0.16	0.18	0.15	0.18	0.16	23588
CAP	0.05	0.05	0.00	0.04	0.29	0.06	0.06	0.04	0.04	0.05	0.05	23667
BM	0.53	0.38	0.05	0.44	2.23	0.45	0.30	0.45	0.29	0.54	0.39	23663
ROA	0.05	0.08	-0.31	0.05	0.25	0.06	0.08	0.06	0.07	0.05	0.08	23667
LOG_AGE	3.95	0.14	3.58	3.97	4.28	3.94	0.15	3.94	0.14	3.96	0.14	15096
LOG_TENURE	2.24	0.77	0.00	2.48	3.22	2.25	0.71	2.25	0.72	2.24	0.78	20983
FEMALE	0.06	0.24	0.00	0.00	1.00	0.05	0.23	0.05	0.24	0.06	0.24	23667

### Table 3 Correlation coefficients among variables

The table presents correlation coefficients among all the variables of the sample of US acquisitions announced between January 1<sup>st</sup>, 1992 and December 31<sup>st</sup>, 2013 drawn from the Thomson Financial SDC Mergers and Acquisitions Database. Stock price data is from CRSP, accounting data is from COMPUSTAT, and the compensation data is from EXECUCOMP. *D\_TAKEOVER* takes 1 if the firm has taken over other firms. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return *LOG\_SALES* is Natural logarithm of total sales revenue and *SALES\_GROWTH* equals  $\text{Log}(\text{Sales}_t / \text{Sales}_{t-1})$ . *SIZE* is Natural logarithm of total assets. *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA*, is defined as the ratio of net income to total assets. *LOG\_AGE* is Natural logarithm of CEO's age and *LOG\_TENURE* is Natural logarithm of number of years the CEO has held the title of CEO at the firm. *FEMALE* takes 1 for firms with female CEOs. \*\*\*, \*\*, \* indicate statistical significance level at the 0.01, 0.05, and 0.10, respectively.



**Table 3 Correlation coefficients among variables**

	D_TAKEOVER	VEGA	DELTA	LOG_SALES	SALES_GROWTH	SIZE	LEVERAGE	CAP	BM	ROA	AGE	FEMALE
VEGA	0.0646***											
DELTA	0.0397***	0.453***										
LOG_SALES	0.0175**	0.506***	0.266***									
SALES_GROWTH	0.0836***	0.00428	0.115***	-0.0622***								
SIZE	0.0311***	0.504***	0.252***	0.846***	-0.0997***							
LEVERAGE	0.00470	0.0327***	-0.0219**	0.185***	-0.0320***	0.233***						
CAP	-0.0557***	0.0542***	0.0391***	-0.00613	0.123***	-0.110***	0.0611***					
BM	-0.0801***	-0.174***	-0.187***	-0.0342***	-0.243***	0.0818***	0.0207**	0.120***				
ROA	0.0598***	0.138***	0.151***	0.125***	0.266***	0.00865	-0.178***	0.124***	-0.429***			
LOG_AGE	-0.0234***	0.0484***	0.0327***	0.141***	-0.0617***	0.139***	0.0339***	-0.0113	0.0248***	0.0190**		
LOG_TENURE	0.000166	0.0713***	0.0412***	0.0287***	-0.0618***	0.0901***	-0.00358	0.106***	0.0780***	0.0288***	0.0284***	
FEMALE	-0.00697	0.00887	-0.00284	-0.00943	-0.0137	-0.0170*	-0.0110	-0.00737	0.0144	0.0112	-0.110***	0.0867***

**Table 4: Multinomial Logit regression-likelihood of taking over**

The table reports the results of multinomial logit regression estimates of Equation (2). We reported relative risk as our coefficient based on non-M&A firms. All other variables are defined in Table I. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return. *SIZE* is Natural logarithm of total assets and *SALES\_GROWTH* is natural logarithm of total sales divided by previous year's sales. *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA*, is defined as the ratio of net income to total assets. \*\*\*, \*\*, \* indicate statistical significance level at the 0.01, 0.05, and 0.10, respectively.

**Table 4: Multinomial Logit regression-likelihood of taking over**

Dependent Variable	TAKEOVER vs NON_TAKEOVER		SAME_INDUSTRY vs CROSS_INDUSTRY	
Independent Variable	I	II	I	II
VEGA	1.891*** (3.16)	1.867*** (3.10)	3.355*** (3.00)	3.352*** (2.99)
SIZE	0.0138 (0.96)	0.00838 (0.56)	-0.0709** (-2.55)	-0.0711** (-2.47)
SALES_GROWTH	1.090*** (10.19)	1.075*** (9.98)	0.413** (2.05)	0.412** (2.04)
LEVERAGE	0.0781 (0.53)	0.0984 (0.67)	-0.870*** (-3.16)	-0.869*** (-3.14)
CAP	-2.200*** (-5.13)	-2.207*** (-5.14)	6.301*** (7.60)	6.301*** (7.59)
BM	-0.541*** (-7.57)	-0.527*** (-7.30)	0.116 (0.80)	0.117 (0.80)
ROA	1.140*** (3.60)	1.126*** (3.55)	-2.452*** (-3.92)	-2.453*** (-3.92)
DELTA		0.0194 (0.93)		0.00104 (0.03)
_cons	-1.603*** (-13.92)	-1.584*** (-13.63)	0.218 (0.97)	0.218 (0.96)
Year and Industry Effect	YES	YES	YES	YES
N	23068	23068	3808	3808

**Table 5: Logit regression - cash payment**

The table reports the results of Logit regression estimates of Equation (4). The dependent variable is Logit (cash payment). All other variables are defined in Table I. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return. *SIZE* is Natural logarithm of total assets and *SALES\_GROWTH* is natural logarithm of total sales divided by previous year's sales. *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA*, is defined as the ratio of net income to total assets.  $A\_PREMIUM = (\text{highest price paid per share} - \text{the target share price four weeks prior to the announcement date}) / \text{target share price four weeks prior to the announcement date}$ .  $RTVALUE = \text{Transaction value} / \text{Acquirer's total assets}$ . *NUMBER\_BIDDER* is the number of bidders during the whole process. *TENDER\_OFFER* equals 1 for tender offers and 0 for others. *S\_IN\_TAKEOVER* equals 1 for target firm that does not have the same two-digit Standard Industrial Classification (SIC) code as the acquiring firm and 0 for others.  $S\_IN\_VEGA = VEGA * S\_IN\_TAKEOVER$ . *LOG\_AGE* is Natural logarithm of CEO's age and *LOG\_TENURE* is Natural logarithm of number of years the CEO has held the title of CEO at the firm. *FEMALE* takes 1 for firms with female CEOs. \*\*\*, \*\*, \* indicate statistical significance level at the 0.01, 0.05, and 0.10, respectively

**Table 5: Logit regression - cash payment**

Dependent Variable	LOGIT_CASH							
Independent Variable	I	II	III	IV	V	VI	VII	VIII
VEGA	0.945*** (4.80)	0.892*** (4.17)	0.673*** (2.95)	0.570** (2.38)	0.723*** (3.10)	0.620** (2.53)	0.654** (2.19)	0.566* (1.82)
S_IN_TAKEOVER	-0.0110 (-0.14)	-0.0111 (-0.14)	0.0667 (0.81)	0.0677 (0.82)	0.116 (1.38)	0.117 (1.38)	-0.0285 (-0.25)	-0.0282 (-0.25)
S_IN_VEGA	-0.228 (-0.78)	-0.229 (-0.78)	-0.360 (-1.21)	-0.363 (-1.22)	-0.333 (-1.08)	-0.333 (-1.08)	-0.0452 (-0.11)	-0.0440 (-0.11)
DELTA		0.0180 (0.65)		0.0412 (1.41)		0.0412 (1.37)		0.0411 (1.02)
SIZE			0.0392 (1.53)	0.0356 (1.38)	-0.00703 (-0.25)	-0.0110 (-0.39)	-0.0369 (-0.97)	-0.0413 (-1.08)
SALES_GROWTH			-0.917*** (-5.20)	-0.952*** (-5.34)	-0.802*** (-4.44)	-0.834*** (-4.57)	-0.942*** (-3.78)	-0.977*** (-3.88)
LEVERAGE			-0.756*** (-3.21)	-0.730*** (-3.10)	-0.704*** (-2.93)	-0.680*** (-2.83)	-0.852*** (-2.79)	-0.828*** (-2.70)
CAP			-3.459*** (-4.63)	-3.509*** (-4.69)	-3.714*** (-4.85)	-3.766*** (-4.91)	-1.939* (-1.83)	-2.041* (-1.92)
BM			-0.0771 (-0.59)	-0.0548 (-0.42)	-0.0934 (-0.71)	-0.0713 (-0.54)	-0.212 (-1.25)	-0.189 (-1.10)
ROA			1.661*** (3.02)	1.660*** (3.01)	1.881*** (3.33)	1.872*** (3.31)	1.131 (1.53)	1.141 (1.54)
A_PREMIUM					-0.00956** (-2.04)	-0.00943** (-2.02)	-0.0118* (-1.84)	-0.0118* (-1.84)
RTVALUE					-1.167*** (-6.54)	-1.166*** (-6.54)	-1.059*** (-4.18)	-1.055*** (-4.17)
NUM_BIDDER					-0.829** (-2.19)	-0.823** (-2.17)	-0.758 (-1.47)	-0.754 (-1.45)
TENDER_OFFER					1.536*** (9.18)	1.537*** (9.19)	1.743*** (6.93)	1.743*** (6.93)
LOG_AGE							-0.283 (-0.87)	-0.267 (-0.82)
LOG_TENURE							0.235*** (3.42)	0.234*** (3.41)
FEMALE							-0.401* (-1.95)	-0.399* (-1.94)
_cons	-0.570*** (-10.36)	-0.574*** (-10.36)	-0.507** (-2.49)	-0.500** (-2.46)	0.745* (1.71)	0.748* (1.72)	1.643 (1.20)	1.588 (1.16)
N	3893	3893	3808	3808	3808	3808	2121	2121
Year and Industry Effect	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo-R-squared	0.0067	0.0068	0.0218	0.0222	0.0535	0.0539	0.0527	0.0530

**Table 6: Ordinary least square (OLS) regression - CAR (0,5)**

The table reports the results of OLS regression estimates of five-day effect of *Vega* on CAR. The dependent variable is the cumulative abnormal return. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return. *SIZE* is Natural logarithm of total assets and *SALES\_GROWTH* equals  $\text{Log}(\text{Sales}_t / \text{Sales}_{t-1})$ . *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA*, is defined as the ratio of net income to total assets. *A\_PREMIUM* = (highest price paid per share - the target share price four weeks prior to the announcement date) / target share price four weeks prior to the announcement date. *RTVALUE* = Transaction value / Acquirer's total assets. *NUMBER\_BIDDER* is the number of bidders during the whole process. *TENDER\_OFFER* equals 1 for tender offers and 0 for others. *S\_IN\_TAKEOVER* equals 1 for target firm that does not have the same two-digit Standard Industrial Classification (SIC) code as the acquiring firm and 0 for others. *S\_IN\_VEGA* = *VEGA* \* *S\_IN\_TAKEOVER*. *LOG\_AGE* is Natural logarithm of CEO's age and *LOG\_TENURE* is Natural logarithm of number of years the CEO has held the title of CEO at the firm. *FEMALE* takes 1 for firms with female CEOs. \*\*\*, \*\*, \* indicate statistical significance level at the 0.01, 0.05, and 0.10, respectively.

**Table 6: Ordinary least square (OLS) regression - CAR (0,5)**

Dependent Variable	CAR[0,5]							
Independent Variable	I	II	III	IV	V	VI	VII	VIII
VEGA	0.0160** (2.23)	0.0131* (1.70)	0.0207** (2.45)	0.0173** (1.98)	0.0213** (2.51)	0.0179** (2.04)	0.0305*** (2.87)	0.0320*** (2.94)
S_IN_TAKEOVER	0.000829 (0.28)	0.000863 (0.29)	0.00146 (0.48)	0.00156 (0.52)	0.00146 (0.48)	0.00156 (0.52)	0.00646 (1.61)	0.00641 (1.59)
S_IN_VEGA	-0.00974 (-0.89)	-0.0103 (-0.94)	-0.0106 (-0.96)	-0.0114 (-1.04)	-0.0110 (-1.00)	-0.0119 (-1.08)	-0.0220 (-1.55)	-0.0215 (-1.52)
DELTA		0.00110 (1.07)		0.00159 (1.49)		0.00160 (1.50)		-0.000950 (-0.64)
SIZE			-0.00141 (-1.50)	-0.00156* (-1.66)	-0.00185* (-1.82)	-0.00201** (-1.97)	-0.00218 (-1.62)	-0.00208 (-1.53)
SALES_GROWTH			-0.00969 (-1.55)	-0.0108* (-1.71)	-0.00986 (-1.57)	-0.0110* (-1.73)	-0.0129 (-1.48)	-0.0121 (-1.38)
LEVERAGE			0.00403 (0.47)	0.00489 (0.57)	0.00449 (0.53)	0.00536 (0.63)	0.000309 (0.03)	-0.000123 (-0.01)
CAP			-0.0617** (-2.48)	-0.0634** (-2.54)	-0.0617** (-2.47)	-0.0633** (-2.54)	-0.0570 (-1.61)	-0.0550 (-1.55)
BM			-0.00552 (-1.21)	-0.00473 (-1.03)	-0.00565 (-1.23)	-0.00486 (-1.05)	-0.00580 (-0.98)	-0.00627 (-1.05)
ROA			-0.0216 (-1.13)	-0.0224 (-1.17)	-0.0199 (-1.03)	-0.0207 (-1.07)	-0.0407 (-1.60)	-0.0406 (-1.59)
A_PREMIUM					0.000201 (1.30)	0.000202 (1.32)	0.000223 (1.11)	0.000224 (1.11)
RTVALUE					-0.00463 (-0.94)	-0.00462 (-0.93)	-0.0137* (-1.89)	-0.0138* (-1.90)
NUM_BIDDER					-0.000775 (-0.07)	-0.000394 (-0.03)	-0.00147 (-0.10)	-0.00156 (-0.11)
TENDER_OFFER					-0.00627 (-1.12)	-0.00630 (-1.12)	-0.00828 (-1.08)	-0.00822 (-1.07)
LOG_AGE							-0.0172 (-1.48)	-0.0173 (-1.49)
LOG_TENURE							-0.00266 (-1.10)	-0.00268 (-1.11)
FEMALE							0.00817 (1.13)	0.00825 (1.14)
_cons	-0.000530 (-0.26)	-0.000835 (-0.41)	0.0167** (2.26)	0.0170** (2.31)	0.0211 (1.55)	0.0210 (1.55)	0.0988** (2.06)	0.0990** (2.06)
N	3018	3018	2961	2961	2961	2961	1672	1672
Year and Industry Effect	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted-R-squared	0.0009	0.0009	0.0032	0.0036	0.0028	0.0032	0.0079	0.0075

**Table 7: Ordinary least square (OLS) regression - CFV (Cash flow volatility)**

The table reports the results of OLS regression estimates of *Vega* on CFV. The dependent variable is the cash flow volatility. *VEGA* is defined as the change in the value (in thousand dollars) of CEO wealth for a 0.01 change in annualized stock return volatility. While *DELTA* is the change in the value (in million dollars) of CEO wealth for a 0.01 change in stock return. *SIZE* is Natural logarithm of total assets and *SALES\_GROWTH* equals  $\text{Log}(\text{Sales}_t / \text{Sales}_{t-1})$ . *LEVERAGE* is defined as long term debt to total assets. *CAP* is defined as capital expenditures to total assets. Book to Market or *BM* is defined as the ratio of total ordinary/common equity to total market value of equity. Return-on-assets, *ROA* is defined as the ratio of net income to total assets. *A\_PREMIUM* = (highest price paid per share - the target share price four weeks prior to the announcement date) / target share price four weeks prior to the announcement date. *RTVALUE* = Transaction value / Acquirer's total assets. *NUMBER\_BIDDER* is the number of bidders. *TENDER\_OFFER* equals 1 for tender offers and 0 for others. *S\_IN\_TAKEOVER* equals 1 for target firm that does not have the same two-digit Standard Industrial Classification (SIC) code as the acquiring firm and 0 for others. *S\_IN\_VEGA* = *VEGA* \* *S\_IN\_TAKEOVER*. *CFV\_CURRENT* is defined as current cash flow volatility. \*\*\*, \*\*, \* indicate statistical significance level at the 0.01, 0.05, and 0.10, respectively.



**Table 7: Ordinary least square (OLS) regression - CFV (Cash flow volatility)**

Dependent Variable	CASH_FLOW_VOLATILITY					
Independent Variable	I	II	III	IV	V	VI
VEGA	0.00272 (0.40)	-0.00339 (-0.46)	0.0231*** (3.27)	0.0189** (2.57)	0.0230*** (3.26)	0.0185** (2.52)
S_IN_TAKEOVER	0.00778** (2.55)	0.00795*** (2.61)	-0.000829 (-0.30)	-0.000707 (-0.25)	-0.00146 (-0.52)	-0.00134 (-0.48)
S_IN_VEGA	0.00000813 (0.77)	0.00000763 (0.73)	0.0000154 (1.62)	0.0000151 (1.59)	0.0000148 (1.56)	0.0000145 (1.53)
DELTA		0.00219** (2.20)		0.00191** (2.07)		0.00203** (2.21)
SIZE			-0.00424*** (-4.79)	-0.00446*** (-5.01)	-0.00366*** (-3.84)	-0.00391*** (-4.08)
SALES_GROWTH			0.0395*** (6.37)	0.0380*** (6.09)	0.0379*** (6.13)	0.0363*** (5.84)
LEVERAGE			-0.0424*** (-5.07)	-0.0415*** (-4.96)	-0.0416*** (-4.99)	-0.0406*** (-4.86)
CAP			0.0799*** (3.45)	0.0793*** (3.42)	0.0792*** (3.43)	0.0786*** (3.40)
BM			-0.00574 (-1.28)	-0.00477 (-1.06)	-0.00468 (-1.05)	-0.00363 (-0.81)
ROA			-0.131*** (-7.07)	-0.132*** (-7.12)	-0.135*** (-7.32)	-0.136*** (-7.38)
CFV_CURRENT			0.288*** (13.79)	0.289*** (13.81)	0.288*** (13.82)	0.288*** (13.85)
A_PREMIUM					0.0000479 (0.35)	0.0000576 (0.42)
RTVALUE					0.0192*** (3.87)	0.0193*** (3.88)
NUM_BIDDER					-0.0168 (-1.63)	-0.0168 (-1.63)
TENDER_OFFER					0.00227 (0.48)	0.00243 (0.52)
_cons	0.0430*** (20.61)	0.0423*** (20.06)	0.0707*** (9.41)	0.0713*** (9.48)	0.0802*** (6.28)	0.0809*** (6.34)
N	2071	2071	2061	2061	2061	2061
Year and Industry Effect	YES	YES	YES	YES	YES	YES
Adjusted-R-squared	0.0058	0.0076	0.1964	0.1977	0.2091	0.2110